AMERICAN DYESTUFF REPORTER

"Circulated Everywhere Dyestuffs Are Used"

Published by Howes Publishing Company, 440 Fourth Avenue, New York

Devoted to the practical application of dyestuffs in all industries; especially to textile chemistry—the science and practice of scouring, bleaching, dyeing and finishing.

VOLUME XXI | JULY 18, 1932 | NUMBER 15

Analytical Methods for a Textile Laboratory

By **WALTER M. SCOTT, Ph.D.**

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EVERY chemist in a textile mill is continually confronted with the question as to the quality of the materials which are being shipped into his plant day by day from many different sources of supply. It is not that the usual requirements of textile processes necessitate the perfection of refinement which characterizes the C. P. grade of chemicals, but it is essential to maintain a reasonable standard of commercial purity and to guard against the presence of any serious adulterations.

Various mills have radically different policies with respect to the testing of materials which enter the plant. Some make it a point to test every shipment regardless of its size and the importance of the work for which it is designed. Others do not make any tests of an analytical nature until something goes wrong in the dyeing or finishing departments and there is a hurried call for an analysis of the materials involved to determine where the fault lies. Obviously there is a happy medium somewhere between these two extremes.

The experience of the writer has demonstrated over and over again the value of a certain amount of analytical testing of materials, particularly in cases where the various processes are being put on a standardized basis. It is realized that when regular shipments of the common standard chemicals are being received from a reputable source of supply, it is not necessary to make a complete analysis of every shipment. However, even in such a case a periodical test for strength and freedom from impurities is a safeguard against any mistakes on the part of the producer.

To sum up, the development of a well-defined scheme of analytical testing in a textile chemical laboratory leads to the following advantages: (1) it reduces to a minimum the possibility of damage to the goods in process due to any fault in the materials used; (2) it enables the purchasing agent to shop around and purchase to a better advantage in price, secure in the knowledge that the laboratory will see that the shipments are up to specification; and (3) it stimulates the producers to observe greater precautions in maintaining the quality of their shipments.

In the course of his experience the writer has had occasion to develop analytical methods for a large variety of chemicals which are met with in the textile industry. For the benefit of other textile chemists who are faced with similar analytical problems, these methods have been collected together and are now published in a convenient form for ready reference. Many of these methods are of general interest to all textile chemists, while some are of special interest to those concerned with the processing of silk. In every case an attempt has been made to choose the simplest and quickest procedure which will yield

INTRODUCTION

The Research Committee of the American Association of Textile Chemists and Colorists has recently appointed a special sub-committee to standardize the analytical methods which are applied to the common chemicals and allied materials used by the textile industry. This action is indicative of the active interest in this particular subject among textile chemists at the present time. Therefore it seems to be an opportune moment to present a collection of such analytical methods which might serve as a basis for discussion in connection with the work of the above mentioned sub-committee. Dr. Scott has had an unusual opportunity to test the value of the methods which he proposes, during his ten years of service as Chief Chemist for Cheney Brothers, silk manufacturers. As an active member of the Research Committee of the A. A. T. C. C., he has kept in close touch with all recent developments along this line.

PART I

PREPARATION OF REAGENTS

Reagent	Components	Solvent	Volume of Solution	Strength of Solution
Acid, Acetic, Glacial	Pure $HC_2H_3O_2$			100% $HC_2H_3O_2$
Acid, Acetic, Dilute	120 gms. Glacial Acetic	Water	1000 cc.	2N
Acid, Hydrochloric, Conc.	Conc. Hcl C.P.			39% HCl (Sp. Gr. 1.2)
Acid, Hydrochloric, Dil.	280.5 gms. conc. HCl	Water	1000 cc.	3N (Sp. Gr. 1.0545)
Acid, Nitric, Conc.	Conc. HNO_3 C.P.			70% HNO_3 (Sp. Gr. 1.42)
Acid, Nitric, Dil.	143 gms. conc. HNO_3	Water	1000 cc.	10% HNO_3 (Sp. Gr. 1.06)
Acid Salt Solution	50 gms. conc. H_2SO_4 NaCl to saturate	Water	1000 cc.	
Acid, Sulfuric, Conc.	Conc. H_2SO_4, C.P.			98% H_2SO_4 (Sp. Gr. 1.84)
Acid Sulfuric, Dil.	102 gms. conc. H_2SO_4	Water	1000 cc.	10% H_2SO_4 (Sp. Gr. 1.07)
Ammonia, Conc.	Conc. NH_4OH, C.P.			28% NH_3 (Sp. Gr. 0.90)
Ammonia, Dil.	358 gms. conc. NH_4OH	Water	1000 cc.	10% NH_3 (Sp. Gr. 0.96)
Ammonium Chloride	214 gms. NH_4Cl	Water	1000 cc.	4N
Ammonium Oxalate	25.5 gms. $(NH_4)_2C_2O_4.H_2O$	Water	1000 cc.	N/2
Barium Chloride	122 gms. $BaCl_2.2H_2O$	Water	1000 cc.	N
Congo Red	5 gms. Congo Red	10% Alcohol 90% Water	500 cc.	1%
Ferric Ammonium Sulfate	50 gms. $Fe_2(SO_4)_3.(NH_4)_2SO_4.24H_2O$ 25 cc. conc. H_2SO_4	Water	1000 cc.	5%
Ferric Chloride	180 gms. $FeCl_3.6H_2O$	1% dil. HCl 99% Water	1000 cc.	2N
Ferrous Ammonium Sulfate	25 gms. $Fe(NH_4)_2(SO_4)_2.6H_2O$ 100 cc. conc. H_2SO_4	Water	500 cc.	5%
Magnesium Mixture	55 gms. $MgCl_2.6H_2O$ 70 gms. NH_4Cl 350 cc. conc. NH_4OH	Water	1000 cc.	
Manganous Sulfate	67 gms. $MnSO_4.4H_2O$ 130 cc. conc. H_2SO_4 138 cc. H_3PO_4(Sp. Gr. 1.7)	Water	1000 cc.	
Methyl Orange	0.5 gms. Methyl Orange	Water	500 cc.	0.1%
Methyl Red	5 gms. Methyl Red	60% Neutral Alcohol 40% Water	1000 cc.	0.5%
Phenolphthalein	5 gms. Phenolphthalein	50% Neutral Alcohol 50% Water	1000 cc.	0.5%
Potassium Bichromate	49 gms. $K_2Cr_2O_7$	Water	1000 cc.	N
Potassium Chromate	97 gms. K_2CrO_4	Water	1000 cc.	N
Potassium Ferrocyanide	106 gms. $K_4Fe(CN)_6$	Water	1000 cc.	N
Potassium Iodide	15 gms. KI	Water	1000 cc.	15%
Potassium Thiocyanate	97 gms. KSCN	Water	1000 cc.	N
Silver Nitrate	42.5 gms. $AgNO_3$	Water	1000 cc.	N/2
Sodium Hydroxide, 30°Be	299 gms NaOH, C.P.	Water	1000 cc.	23.7% (Sp. Gr. 1.263)
Sodium Hydroxide, Dil.	112 gms. NaOH, C.P.	Water	1000 cc.	10% (Sp. Gr. 1.116)
Sodium Phosphate	119 gms. $Na_2HPO_4.12H_2O$	Water	1000 cc.	N

results of sufficient accuracy for practical purposes in the mill. Determinations are made of only those factors which are of vital importance to the strength or purity of the material in question. Wherever possible there is included an average analysis which is representative of a good commercial grade of this material. It is realized that there may be many possible variations of the procedures which are outlined in this article, and the writer will be very glad to receive any comments or suggestions for improvement.

The first section of this article contains a table indicating the composition of all the laboratory reagents which are mentioned in the subsequent analytical methods. The second section is devoted to a description of the preparation and standardization of all the standard solutions which enter into these analyses. The third section contains the analytical methods themselves, arranged alphabetically according to the chemical names of the materials as far as possible. There is also a cross-index which includes not only the chemical names, but also the trade names which are in common usage.

PART II—STANDARD SOLUTIONS

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Preparation and Standardization

No. 1 Acid Hydrochloric (Approx. N/10)

Preparation

100 cc. dilute HCl (3N) are diluted to 3 liters with distilled water.

Comparative Standard

The above solution of acid is titrated against the N/10 NaOH using Methyl Red or Congo Red as an indicator and then water is added in calculated amount until the two solutions are equal in strength.

Absolute Standard

Weigh about 0.2 gms. pure Na_2CO_3 (prepared by heating pure $NaHCO_3$ to constant weight at low red heat with stirring), add 200 cc. of water, and 50 cc. of standard acid. Boil until all CO_2 is removed. Cool and titrate with standard alkali. Calculate normality of the two solutions.

1 cc. normal solution = 0.05305 gms. Na_2CO_3

No. 2 Acid Hydrochloric (Approx. N/2)

Preparation

400 cc. dilute HCl (3N) are diluted to 2400 cc. with distilled water.

Standardization

Titrate against the standard alkali (N/10) and calculate normality.

1 liter of N/2 HCl solution should contain 18.235 gms. HCl.

No. 3 Acid Hydrochloric (Approx. Normal)

Preparation

800 cc. dilute HCl (3N) are diluted to 2400 cc. with distilled water.

Standardization

Titrate against the standard alkali (N/2) and calculate normality.

1 liter of N/1 HCl solution should contain 36.47 gms. HCl.

No. 4 Acid Sulfuric (N/50)

Preparation

1 cc. of pure conc. sulfuric acid is added to about 1000 cc. of distilled water.

Standardization

1.061 gms. of recently ignited pure Na_2CO_3 are dissolved in water and diluted to exactly one liter in a volumetric flask. 50 cc. of this solution are heated to boiling and then titrated with the sulfuric acid, using Methyl Orange as an indicator. Calculate the amount of water to add to the acid to make it N/50. The addition should be slightly less than the calculated amount. Repeat the titration and addition of water until the acid is exactly N/50.

1 cc. N/50 H_2SO_4 = 0.001061 gms. Na_2CO_3

No. 5 Alcohol (Absolute)

Preparation

1 kgm. of fresh quick lime is added to 10 liters of grain alcohol (95%) in a flask immersed in a water bath. The flask is attached to a return condenser and the alcoholic solution boiled for six hours then allowed to stand over night. The condenser is now inverted and the alcohol distilled off from the lime. Determine the specific gravity at 15°C. and calculate the strength by consulting the tables in Van Nostrand's Chemical Annual or a similar handbook.

No. 6 Alcohol (Neutral 95%)

Preparation

A few drops of Phenolphthalein are added to 250 cc. of grain alcohol and then N/10 NaOH is added drop by drop until a faint pink tinge is perceptible.

No. 7 Bromine (Approx. N/10)

Preparation

Weigh exactly 2.784 gms. of pure potassium bromate (dried to constant weight at 100°C.) and about 10 grams of potassium bromide. Dissolve these salts together in water and dilute to exactly one liter in a volumetric flask.

No. 8 Calcium Chloride (N/250)

Preparation

0.2 gms. of pure calcium carbonate are accurately weighed into an evaporating dish and dissolved in dilute HCl. The solution is evaporated to dryness on the steam bath, redissolved in water and evaporated again. This operation is repeated several times until it is certain that a perfectly neutral salt remains. This is then dissolved in water and diluted to exactly 1000 cc.

No. 9 Fehling's Solution

Preparation

1. Copper Sulfate

Dissolve 34.639 gms. of pure $CuSO_4.5H_2O$ in water and dilute to exactly 500 cc. volume.

2. Rochelle Salts

Dissolve 175 gms. of Rochelle Salts and 50 gms. of pure sodium hydroxide in water and dilute to exactly 500 cc. volume.

No. 10 Formaldehyde (Neutral 20%)

Preparation

20 gms. Formaldehyde U.S.P. are dissolved in 100 cc. distilled water. A few drops of Phenolphthalein are added to the solution and it is then titrated with N/2 NaOH until a faint pink tinge persists.

No. 11 Gelatine Solution

Preparation

20 gms. of gelatine (best grade) are soaked in water for 3 hours, then dissolved on the steam bath in a liter of water. The solution is saturated with common salt and then filtered.

No. 12 Indigotin (1%)

Preparation

1 gm. of pure indigotin is dissolved in 50 cc. conc. sulfuric acid. The cold solution is diluted to exactly one liter.

No. 13 Indigotin (0.1%)

Preparation

100 cc. of the above solution are diluted to exactly one liter.

No. 14 Iodine (Hanus Solution)

Preparation

Dissolve 13.2 gms. of finely ground iodine in about 800 cc. of pure glacial acetic acid by warming on the steam bath. Cool, add 3 cc. of pure bromine, and make to a liter with glacial acetic acid.

Standardization

This is accomplished by running a blank in connection with each analysis in which this solution figures.

No. 15 Iodine (Approx. N/10)

Preparation

Dissolve 13 gms. of finely pulverized iodine, with about 20 gms. of pure potassium iodide in 50 or 60 cc. of water by warming gently, then dilute with water to exactly one liter.

Standardization

Take a measured amount of N/10 sodium thiosulfate solution and titrate with the iodine, using starch as an indicator.

No. 16 Standard Iron Solution

Preparation

Dissolve 0.70 gms. of $Fe(NH_4)_2(SO_4)_2.6H_2O$ in 50 cc. of distilled water and add 20 cc. of dilute sulfuric acid. Warm slightly and add N/2 $KMnO_4$ drop by drop until the pink color persists for five minutes. Dilute to one liter.

1 cc. Standard Iron Solution = 0.0001 gm. Fe

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Hollow Rayons

A Note on Some Recent Developments

By A. J. HALL, B.Sc., F.I.C., F.T.I.

The so-called hollow rayons represent a type of artificial fibre which, while not in great demand today, is likely to be much more widely used in the future. For it must be admitted that very little progress has been made in the manufacture of rayons capable of being manufactured into fabrics having the warmth of wool and real silk. This property of rayon must ultimately be strongly developed if the manufacture of rayon is to expand so as to replace the cultivation of natural fibres, and it is likely that warmth of handle will be obtained by modifying methods of production such that the resulting rayon has a more porous structure than it has at present. Air, it may be noted, is one of the worst conductors of heat.

THERE is no reason to believe that the heat conducting power of a rayon fiber can be reduced (its warmth of handle will thereby be correspondingly increased) if the compact continuous structure of the cellulose of cellulose ester composing the fiber be retained. Two methods for increasing this warmth of handle are possible. In the first, the fiber may be made irregular in form, for example, it may be given crimps or waves (as in the case of wool) so that when made into yarn and fabric considerable air space exists between the individual fibers. Or in the second case, the air spaces may be formed actually within each individual fiber. Attempts to produce an aerated rayon fiber have shown that warmth of handle can be attained along these lines and today such a rayon (Celta) finds an extended use in the manufacture of all kinds of rayon garments.

Although a hollow or aerated fiber was first successfully obtained in the manufacture of viscose rayon it has more recently been found possible to produce hollow cellulose acetate rayon. Such hollow rayons are similar to ordinary viscose and cellulose acetate rayons except that each fiber contains innumerable hollow spaces or cavities formed by escape of a gas or volatile organic solvent.

An obvious consideration which must govern the manufacture of hollow rayon is that the tensile strength of such rayon must not be less than that of a similar solid rayon. If the spaces are too large or inappropriately spaced then loss of strength is certain to result. It is this difficulty which has made success in hollow rayon manufacture difficult to attain and led to specialization in the manufacture.

In manufacturing viscose rayon by ordinary methods quite considerable quantities of gases (carbon dioxide, sulphuretted hydrogen, etc.), are liberated from each fiber as it is coagulated in the spinning bath. But by adding sodium carbonate to the viscose spinning solution and using this at a suitable degree of ripeness it is possible to ensure the retention within the fibers of a proportion of the liberated gas thereby producing a hollow viscose rayon. This is the most simple method of manufacture but reference to the patent literature shows that the same result has also been achieved by incorporating in the spinning solution highly dispersed bubbles of an inert gas such as nitrogen, hydrogen, and air.

Hollow viscose rayon has a specific gravity of about 1.3 as compared with 1.5 for ordinary viscose rayon. This signifies that the hollow rayon has a greater bulk and therefore has greater covering power when used in fabrics. Also, owing to the internal spaces, the rayon has a subdued luster.

From the technological point of view the production of hollow cellulose acetate rayon is perhaps of more interest, but before proceeding to deal with this it may be also interesting to indicate a process by which hollow viscose rayon may be produced.

By adding say 5% of sodium carbonate to a viscose solution, about 13,000 c.c. of carbon dioxide is liberated during the spinning of 100 grams of rayon, but under ordinary conditions only a small part of this gas remains in the rayon. If, however, the ripening process preceding spinning is curtailed so that an immature viscose solution is used then more of the gas is occluded. According to E. P. 343604, however, the occlusion of gas may be increased by the addition to the viscose solution of quite small amounts of naphthalene, nitronaphthalene, camphor, anthracene, or mixtures of these, and the following manufacturing process utilizes this fact. Thus a viscose solution containing 7% of alkali and 7½% of cellulose (as cellulose xanthogenate) and ripened for not more than 6 to 10 hours is mixed with finely divided naphthalene (200 mg. per 1 kg. of viscose) and then spun into a coagulating bath having the following composition:

Sulphuric acid	9%
Magnesium sulphate	18
Sodium sulphate	7
Zinc sulphate	1

The resulting rayon contains so much hollow space that it does not readily sink in the spinning bath.

Turning now to cellulose acetate rayon it has been discovered that this may be produced having hollow spaces by adding to the acetate solution a small proportion of a solvent which is removed by evaporation during the spinning process at a different rate from the acetone which is

used as the main solvent. The process described in E. P. 341388 illustrates this. Here cellulose acetate is spun into a coagulating bath in which at least one constituent of the solution of cellulose acetate is insoluble or incompletely soluble; the coagulating bath is maintained at the boiling point of this constituent. The coagulating bath itself may be any liquid which is a non-solvent for cellulose acetate and which is at least partially miscible with the solvent mixture used in the spinning solution but which is not miscible with the special constituent. It is obviously preferable for this special constituent of the spinning solution to have a low boiling point and suitable substances include mixtures of ethylene dichloride or methylene dichloride with ethyl or methyl alcohol. The following is a suitable spinning solution:

Cellulose acetate (54% acetyl content)	25 parts
Ethylene dichloride	45 parts
Methyl alcohol	30 parts

This solution is spun through spinnerettes of 0.08 mm. diameter into a coagulating bath consisting of kerosene at 65° C.; the speed of spinning is 50 meters per minute and the length of immersion in the coagulating bath of the rayon is maintained at 12 to 16 inches.

In another process for producing hollow acetate rayon a solution of cellulose acetate is employed which contains a mixture of cellulose acetate solvents together with one non-solvent (excluding alcohol) which has a higher boiling point than the solvents and constitutes at least 20% of the mixture. This solution is heated before leaving the spinnerettes to a temperature sufficient to cause it to issue into an atmosphere having a temperature below the boiling point of the non-solvent. This non-solvent thus tends to remain in the rayon after evaporation of the usual solvent, say acetone, and during its subsequent removal from the partially solidified rayon small cavities are formed. The following are the spinning particulars:

The spinning solution consists of:

Cellulose acetate	24 parts
Acetone	60 parts
Toluene	15 parts

and it is spun through spinnerettes of 0.075 mm. diameter while maintained at 60° C. into air at 20° C. The resulting rayon is not only hollow but has a dull matt appearance.

Fig. 1 Tapered Spinnerette for producing hollow acetate rayon.

It has also been found that hollow acetate rayon may be produced without the use of special solutions provided that the spinnerettes are suitably shaped. According to E. P. 353041, it is sufficient for the cellulose acetate solution to be spun through dies which are correctly tapered as shown in Fig. 1. The amount of taper depends on the viscosity of the spinning solution but in general it may be from 0.05 to 0.10 mm. diameter or from 0.06 to 0.09 mm. diameter when the spinning solution contains 12 to 26% or 35% of cellulose acetate; spinning should be carried out in hot air.

In a process of this nature it is satisfactory to spin a 23½% solution of cellulose acetate in acetone maintained at 55 to 57° C. through a die tapering from 0.05 mm. to 0.10 mm. diameter into air at 100° C.; the spinning rate may attain 110 meters per minute.

Hollow acetate rayon cannot be produced by incorporating air or other gas in the spinning solution since this leads invariably to the formation of fissures and cracks in the resulting rayon such that it has a low tensile strength. Furthermore it is objected that methods for producing a hollow rayon in which the spinning solution must be maintained at a high temperature are difficult to work. For this reason the Kohorn patents for the manufacture of *lumen* (a type of hollow rayon) acetate rayon appear particularly valuable since the processes protected by them can be carried out under almost ordinary conditions. The production of such rayon is described in E. P. 314534 and it also forms the subject of an interesting article by H. Schupp (Kunstseide, 1931, *13*, 424).

Essentially the Kohorn process is such that when the cellulose acetate rayon issues from the spinnerette it immediately becomes covered with a thick but elastic skin so that further evaporation of solvent from the interior of the fiber must result in a stretching of this skin—the fiber thus becomes voluminous and gains a hollow core or lumen. The formation of a skin is ensured by adding to the spinning solution certain precipitants (these are usually liquid non-solvents for cellulose acetate) and in an amount which generally exceeds 30% calculated on the weight of cellulose acetate present. Care has to be shown in the selection of these precipitants since unless they actually ensure the skin formation no lumen is formed.

Thus water and toluene are each precipitants for cellulose acetate but curiously neither of these added alone to a cellulose acetate spinning solution effectively produce a lumen; a mixture of water and toluence does work satisfactorily. Also it has been found that the precipitant is much assisted by the presence of small quantities of alcohol. The following are two examples of spinning solutions which yield lumen or hollow acetate rayon:

(1)	Cellulose acetate	1.0 kg.
	Acetone	4.0 litres
	Alcohol	0.5 litre
	Benzene	0.5 litre
(2)	Cellulose acetate	1.0 kg.
	Acetone	4.0 litres
	Water	0.6 litre
	Toluene	0.4 litre

Both of these spinning solutions should be spun at 65° C. into warm air to give 75 denier yarn; the resulting yarn has a low luster this being roughly inversely proportional to the relative size of the lumen.

In Fig. 2 is shown a cross section (taken from a microphotograph) of cellulose acetate fiber produced under conditions such that no outer skin is formed during the

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Proceedings of the American Association of Textile Chemists and Colorists

The American Association of Textile Chemists and Colorists

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CALENDAR OF COMING EVENTS

Annual Meeting, Dec. 2 and 3.

* * *

FINAL MEETING, PHILADELPHIA SECTION

THE final meeting this season of the Philadelphia Section was held at the Whitemarsh Valley Country Club, Chestnut Hill, Philadelphia, Friday, June 24th, 1932.

The business meeting was called to order by the Chairman, Mr. Seibert, at 9 P. M. after the usual informal dinner.

The minutes of the previous meeting were read and approved.

There being no other routine business, the nominating committee report was submitted by Mr. Lawrence F. Ryan and was as follows:

Chairman, Mr. William A. Stringfellow.
Vice-Chairman, Mr. Robert A. Bruce.
Secretary, Mr. Charles A. Seibert.
Treasurer, Mr. Robert E. Sullivan.
Council, Mr. B. Kendall Archer, Mr. Elmer C. Bertolet, Mr. A. Moody Burt, Dr. Donald H. Powers.

After the usual procedure these gentlemen were elected and Mr. Stringfellow directed the remainder of the meeting.

The secretary, Mr. Seibert, was elected to represent the the section as a member of the nominating committee for national officers.

Prior to the dinner some members and their guests had availed the opportunity to indulge in the sports provided for the occasion.

The meeting had been arranged principally for social activities and no papers were read.

Before adjourning, the thanks of those present were extended to Mr. Charles F. Credo who arranged for the use of the club and directed the social activities.

The secretary was directed to express to the retiring treasurer and resigned secretary the thanks and appreciation of the section's members for the services they had rendered.

After adjournment at 10 P. M., round table conversations and refreshments were enjoyed.
Attendance, 40.

Respectfully submitted,
Charles A. Seibert,
Secretary.

Proceedings of the American Association of Textile Chemists and Colorists

A Method for Simultaneously Making a Large Number of Perspiration Tests*

By **JOHN N. DALTON**
Chief Chemist (Worsted Division), Pacific Mills

THIS is a warm subject I am going to speak about, not only in thinking of perspiration itself, but also from the amount of discussion that should arise as to the proper method of testing the fastness of colors to perspiration. There are a number of methods that have been suggested for this particular test, however, we feel that some are not severe enough and some are too severe. What I am going to speak about is the method and apparatus that has been in use in the Pacific Mills' worsted department chemical laboratory. You will probably think that my talk will develop into a defense of the standard method recommended by the research sub-committee on fastness to perspiration, although we have removed one or two of the objections to the committee's recommendations which have been listed in the 1930 Year Book of this association.

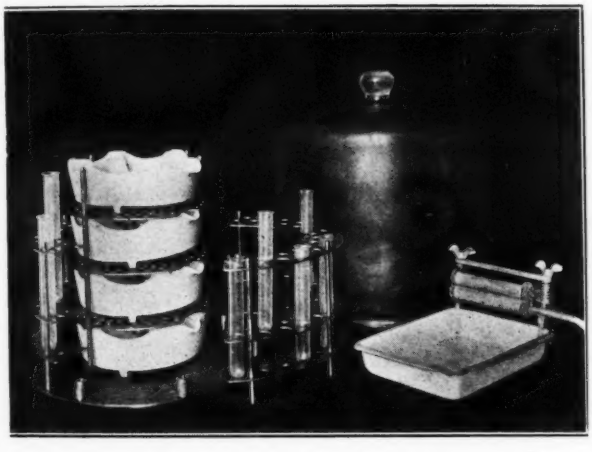
In our method of testing, we use the same solutions that are recommended by the sub-committee. For those of you who are not familiar with these, I am going to describe them briefly. There are two that are used, one is an acid solution that is a mixture of 10 gms. sodium chloride, 1 gm. U.S.P. lactic acid, and 1 gm. disodium ortho phosphate per litre, and has a pH of 4.5. The other is an alkaline solution and contains the same amount of sodium chloride, 4 gms. of ammonium carbonate and 1 gm. disodium ortho phosphate per litre and has a pH of 8.08. We think those solutions are suitable for perspiration tests and in corroboration wish to refer you to the work of Vass and McSwiney mentioned in the 1930 year book, which was published in the Journal of the Society of Dyers and Colorists in the June issue, 1930. As described in this article, Vass and McSwiney of the physiology department of the University of Leeds, by actual chemical analysis, analyzed the perspiration from a number of both female and male subjects. In order to do this successfully, all of the micro organisms first had to be removed in order to eliminate any chemical change during the analysis. I am going to read you their analysis of perspiration. The average perspiration of ten normal female subjects showed a pH of 6.57, ammonia nitrogen 6.0 mgs., amino acid nitrogen 6.5 mgs., urea-nitrogen 19.23 mgs. and glucose 20 mgs. per 100 c.c., while the sodium chloride was 3.0 grams per 1,000 c.c. The average from fourteen normal male subjects showed a pH of 6.14, the ammonia nitrogen 4.7 mgs., urea-nitrogen 21.44 mgs., amino acid nitrogen 5.0 mgs., glucose 12.6 mgs. per 100 c.c. and sodium chloride 3.70 grams per 100 c.c. In this summary, it would be well to note in perspiration the presence of chlorides, ammonia nitrogen, urea-nitrogen, and the amino acid nitrogen. Due to the high urea content, you should expect natural perspiration in the presence of micro organisms to show a higher ammonia nitrogen content on standing and become more alkaline as the urea is decomposed into ammonia and carbon dioxide. Vass and McSwiney have shown this by measuring the pH changes of perspiration in various time intervals as follows: Fresh perspiration showed a pH of 5.95, after 6 hours 6.29, after 17 hours 7.0, after 24 hours 7.28, 41 hours 7.62 and 60 hours 7.7. Accordingly, if we use one solution with a pH of 4.5 and another with a pH of 8.08 as recommended by the sub-committee, we think we are obtaining the effect of acid or alkaline perspiration on the color.

In the method of testing recommended by the sub-committee, a single desiccator containing 70% sulphuric acid with a single test tube containing the dyed sample in the desiccator at room temperature is prescribed for a single test. As we have had an urgent demand for testing a great many samples, probably 100 at one time, it was impossible to obtain a sufficient number of these single desiccators to make the tests with any degree of rapidity. This large amount of apparatus for making a quantity of perspiration tests is one of the serious objections that has been made against the standard test. Accordingly, our problem was to develop a means of making a great many perspiration tests with a minimum of apparatus, eliminating the expense of the latter and the danger of handling so much concentrated sulphuric acid in the laboratory. In developing our apparatus, we tried to duplicate the results that are obtained using a single desiccator and we have succeeded in accomplishing this very closely while making 56 tests at one time. I have here a number of comparative perspiration tests using our apparatus and that prescribed in the standard method from the 1930 year book. I will pass these cards around and you will readily see that the tests compare

*Presented before the Northern New England Section, May 7th, at Cambridge, Mass.

very favorably. The colors used in these tests include fast to light direct cotton colors, fast acid wool colors and chrome dyestuffs used on wool. Colors have been deliberately selected which, though fast to light, are not fast to perspiration to obtain considerable bleeding in order to compare the efficacy of both sets of apparatus.

We have brought our apparatus here which is easily portable and have assembled it so that you could have a clearer understanding of its details than could be obtained by only a word description of it. Its parts can be easily made and purchased from any of the laboratory supply houses. As you can see, it consists of a 12-inch bell-jar set on a ground glass plate which will enable an air-tight joint to be obtained with a vaseline seal. Under the bell-jar is this double test-tube rack which is built in two sections, one of which is removable. This test-tube rack accommodates 28 test tubes in the lower tier and 28 test tubes in the upper one. The rack is fastened to a stationary base which supports 3 perforated shelves to hold ordinary six-inch porcelain acid desiccator dishes. The rack, shelves and base support are made of 18-8 stainless steel.



Apparatus for making perspiration tests.

In using this apparatus, we do not use the 70% sulphuric acid as recommended in the standard test, but the 66° Baume or 93.5% commercial acid. The use of this stronger acid helps to obtain the same rate of drying in the 48 hours as is obtained in the standard test. The question may arise as to how the same rate of drying is obtained in our apparatus when the ratio of wet cloth to acid drying surface is approximately three or four times as large as when a single test tube in the small desiccator is used. The reason for greater efficiency of drying may be due, in addition to the stronger sulphuric acid that is used, to the greater circulation of air that results in the placing of the acid dishes above the wet surface to be dried. The drying acid should be changed after every run when more than 40 tests are in the apparatus at one time, but can be used for a week if less than 10 are being run. In order to change this acid the test-tube rack has been so arranged as mentioned above that a section of it can be removed, thus allowing free access for removing the porcelain dishes.

The standard test stipulates a hand wringing after immersing the colored and uncolored cloth in the perspiration test solutions and then rolling into a loose roll and placing in the test tube. In weighing a number of samples prepared for test in this manner, we discovered an appreciable variation in the weight of the amount of perspiration solution taken up by the cloth. This variation is doubtless due to the personal factor and to eliminate such, we adopted the use of this toy wringer with adjustable wing nuts for regulating the roller pressure and a photographic solution tray to use with it. By passing the cloth through the tray and wringer, we can obtain uniform weights of cloth and solution.

A comparison of perspiration tests in our apparatus with the results which have been obtained from cloths which have failed in actual personal wear show a very close similarity. Certain colors which do not show the best fastness to perspiration in this apparatus have apparently given service in actual wear which have caused no complaint. Accordingly, it is our opinion that we are giving the dyed samples a safe laboratory test.

In conclusion I wish to mention that Mr. F. E. Burnham and Mr. F. J. O'Neill, both members of the Pacific Mills worsted laboratory staff and of this Section, assisted in working out the details of this apparatus.

Thank you.

Discussion

Mr. Christison: I wish to thank Mr. Dalton and congratulate him on the work he has done and for his very good solution of a troublesome detail of making a large number of tests. The work has been very well done.

I have with me a suit representative of a good many that I would like to exhibit at the meeting. Mr. Dalton mentioned that he thought the perspiration tests were severe enough. Well, that all depends on how you look at it. Our dyestuff friends who like to put out attractive color cards think they may be over severe. As a matter of fact, two or three leading dyestuff concerns objected to the tests as they were first formulated and were quite insistent that we cut the acidity of one in half. Vass and McSwiney showed that perspiration was neither very acid nor very alkaline and that the tests as they were first formulated called for more acid than any known perspiration. The principal source of contention was in connection with Chromotrope F4B. Our concern and many of our competitors were using this dye in large amounts. The cloth colored with Chromotrope F4B showed up rather poorly in the acid tests so that the dyestuff con-

cerns rightly accused us of inconsistency. In other words, we were putting on the market material that our perspiration tests discredited. The dyestuff concerns, of course, hesitated to recommend a color which might not be satisfactory and yet neither our concern nor any of our competitors that we could find had had a single return from garments colored with the dye in question. For this reason, the committee decided to cut the acidity of the testing solution one-half which even then left a solution that was much more acid than any perspiration that Vass and McSwiney or any other physiologist that we could find have reported. The garments on exhibition here tonight were returned to a nationally known clothing manufacturer for adjustment. All the garments in question were dyed brown. The appearance of the garments are rather remarkable and it is quite evident from inspection that urine as well as perspiration stains are involved. Our friends who study physiology tell us there is quite a close relation between urine and perspiration and probably the effect of the two on cloth will have to be considered together. The clothing manufacturer contended that the principle trouble with the garments was that they would not stand acid perspiration. On investigation, we arrived at the conclusion that the garments have been principally dyed using the well known dye of the Acid Anthracene Brown RH type and although we cannot state definitely, believe that the dye was applied by the chrome in the dye bath method, as the percentage of chrome in the cloth is smaller than we would expect from using either the top chrome or chrome bottom method of dyeing. The clothing manufacturer gave as his reason for claiming that the garments were injured by acid perspiration that when the garments were soaked in 14% acetic acid at 150° F. for one hour the discoloration produced was quite close to the discoloration in the garments. It must be noted that in order to get the coloration in question the dyed goods must not be rinsed after the acid test but must be squeezed and dried with the acid in them. The brown in question is made or sold by several manufacturers and all dye of this type available to us behaves the same way showing that the phenomenon was not confined to the product of any one manufacturer. The dye in question is much more stable to alkaline treatment and is quite satisfactory in this respect. The reddish color produced by soaking in organic acids is not removed by neutralizing. And, in order to reproduce stains of the intensity observed, it is necessary to use a solution not 2 gms. per liter lactic acid that our dyestuff friends complained of as being too severe but about 125 gms. per liter. My medical friend tells me that such a concentration of acid in any human excretion is entirely out of the question, but as a matter of fact, the discolored garments are here and should be accounted for. If there was only one garment it might be dismissed as an isolated case but when about 50 are returned from different parts of the country the trouble can not be ignored.

The samples shown are from cloth from the trousers and in addition to the salt used in the tests, varying amounts of lactic acid were use, 1—5—25—125 gms. per liter. You can see that only the 125 gm. per liter lactic acid and salt test show as much discoloration as the garment. This might indicate that our test is not severe enough.

Here is a suit from another part of the country. The wearer has perspired so freely that he has destroyed the dye in the coat lining. He has even perspired so freely that the lining itself is somewhat disintegrated and in spite of this punishment, there is no discoloration of the worsted cloth of the suit under the arm-pit. While the under arm cloth was wet the wearer swung his arm so vigorously as to do a fairly good job of milling.

The man to whom the suit belonged must come from some place where they don't wear shirt collars because on the coat cuffs and around the collar we get the same discoloration as on the trouser knees where the cloth comes in direct contact with the skin.

This exhibit shows that the dye in the discolored places is not destroyed because the color can be restored by boiling in acetic acid of dye bath strength, that is, .5 gm. per liter of 100% acetic acid. Restoration is even better when a little chrome also is used.

One of the exhibits represents a normal part of the garment not affected, another badly discolored is from the knee where the perspiration has discolored it and the piece I now show was just as badly discolored and cut from an adjacent place but has been treated with boiling chrome and acetic acid of dye bath strength. The color is restored. It looks as if the combination between the dyestuff and the mordant has been loosened and that what we are getting is the appearance of the color acid. And, it does seem as if some influence other than acid has done it. Whether it is bacteria or not I am not prepared to say. We would like help and criticism so that the trade will have confidence in them and yet would like to make the tests reasonable enough so that dyes we know will give satisfaction, will pass. There are things about perspiration some of you have noticed. For instance, Alizarine Blue SAP dyed acid without chrome is rather a peculiar color. When dyed in combination with another blue or when tested by itself, using a salt solution no discoloration is produced. But, when dyed in combination with acid orange, yellow, red and to a lesser extent violet, it shows quite serious defects on coming in contact with common salt solutions. These defects are removed by warm water and it looks as if Alizarine Blue SAP in the presence of salt assumes the color of the dry color acid, which probably is reddish. And, when the salt is washed out, the appearance of the garment is quickly re-

stored but this is not the case in the garments in question. In regards fastness to perspiration, there is perhaps a practical and theoretical way of looking at it. From a practical point of view I haven't found a mill chemist yet who has seen ordinary true chrome dyestuffs that have fallen down from perspiration failure, unless we consider these garments as an exception. Most of the mill chemists have had their trouble with acid and direct cotton colors.

I don't know that there is anything more I can say except I would like to congratulate Mr. Dalton again in his development of a very ingenious apparatus for making these tests. I would like some comment from the members here as to how severe we ought to make our tests.

One of the larger dyestuff firms has handed me a questionnaire.

First—Granting that a dye will stand its first saturation of perspiration from a person of normal body acidity as well as the alkaline effect of the dried state of this perspiration, just how many repeated saturations of this kind should a dye be expected to withstand?

My answer is that the wearer of a suit should get satisfaction and can buy suits that will give satisfaction. The suit should be free from discoloration until it is worn out and it is our experience that garments dyed with true chrome colors give this satisfaction.

Second—If for example, your test should cover fifteen saturations and subsequent dryings during the specified period or season, to answer the acid requirements, will this dye after such experiences still retain its fastness to exposure to both light and moisture?

I know of no evidence of perspiration causing a loss of fastness to light or water except that when a suit dyed with acid colors has the slight amount of acid which is left in it from the dye bath removed or the cloth made alkaline. The tendency is for the acid dye to bleed with water.

Third—In either of the above instances what would be the effect upon such examples if dry cleaned or washed in soap and water?

Men's wear should stand any amount of dry cleaning with the ordinary solvents and should be fast to a moderate amount of soap and water.

Fourth—If it is true that super-acidity in the bodies of many people is destructive to an extraordinary degree, approximately what percentage of men's wear wearers could be expected to reflect this unusual acidity; and should it be understood that the virtues of dyes withstanding this test could be considered as applying only to normal individuals and specifically excepting those with a super-acid condition?

I hardly know how to answer this question because evidently there is something else beside acidity enters into the question. Because when you consider that all the authorities feel that the acidity of perspiration and urine is rather limited and we have to use an excessively acid solution in order to apparently reproduce the stains in the garments I think we may have to look somewhere else for the cause than acidity, and we shall have to devise some other method to truly reproduce the stains in these extraordinary suits. The fact that where the perspiration in the man's arm-pit has not caused trouble and something on his neck and wrist have, are quite significant.

Mr. Dalton: Mr. Christison very kindly gave me a piece of the cloth from the garment which he has brought here and we tested it in our apparatus but the test doesn't show anything like the staining on the garment, yet there is a noticeable effect on the color.

Mr. Christison: But, the man didn't complain of bleeding, it was the discoloration of the suit.

Mr. Dalton: There is another perspiration test which I happened to discover, which may be of interest. This test is recommended in "Dyeing of Textile Fibers" by Horsfall and Lawrie, Benn (1927). I think this book is the most recent English book published on dyeing. The test is as follows: "Dyed wool is wrapped tightly around a glass rod between undyed wool and cotton. Steep ten minutes at 40° C. in 100 gms. NaCl, 100 c.c. 30% acetic per liter, then keep in corked test tube for twelve hours and dry without washing. Note change in shade and staining on wool and cotton." This garment stains very badly when subjected to this test, but the change in shade is nothing like the stain on the garment.

Mr. Moorhouse: Well, if it was strongly acid, but the alkali has practically no effect on it. That acid has to be added to bring up the degree of perspiration. When the goods are first dyed there is more or less acid left in them, but you can take the same goods and get the same change—perspiration plus the acid. Then you have to assume that when the man got the goods they were quite acid. Those goods are old now and have been worn. They go alkaline. You see the cloth is faintly acid.

Mr. Christison: The unfortunate part is that before we got hold of the garments they had been to a dry cleanser. It is rather difficult to know just what a dry cleanser would do. It would have been more informative if we had the goods directly from the man.

Mr. Dalton: We have had garments returned to us from the middle and south west and in every case a test in our apparatus shows a close similarity to results from actual wearing conditions. I wish to call your attention to Chromotrope Blue, Color Index No. 180. One of the cards passed around shows Chromotrope dyed in the ordinary way with a reasonable amount of chrome and developed with the regulation time. As the alkaline test

shows, Chromotrope appears rather unsatisfactory. It bleeds quite badly. But, as shown on the other card, if one adds excess chrome to the bath there is no bleeding. It is apparent that the alkaline perspiration solution releases chrome in combination with the Chromotrope.

Mr. Grady: I'd like to ask if you have made a check on the test by comparison with the cloth worn by any mill operatives?

Mr. Dalton: No, we have not made any test with cloth in that manner.

Mr. Durfee: In using the toy wringer, just what weight of solution is left in the testing?

Mr. Dalton: The samples weigh 9½ gms. wet and 3½ gms. dry.

Mr. Kittredge: Mr. Dalton, do you think the solution developed by the committee suitable to testing the decoration of cotton fabric to perspiration? I have heard one method recently offered. I don't know the authority, but, they submit the cloth to 10 minutes of 20 sulphuric cold, give them a little rinse and keep them in cold water for two hours, then hang them up in the testing room with constant humidity and I find the cloth has lost 50% in strength in some cases.

Mr. Dalton: I do think that the solutions recommended by the committee are suitable for the testing you mention. However, I do not see the logic of using such a solution as you mention in view of the analysis of perspiration of which I have previously spoken.

Mr. Grimes: Any further question? I believe all these garments have been returned from south of the Mason-Dixon Line where they claim that a hot nigger always crocks.

Mr. Durfee: If a man had mercury poison, you give him salt and break up the combination of the mercury. I have a feeling that the drying down of the sweat and the formation of concentrated saline mass may occasionally break up some of our chemicals. In regard to acid in the goods, I think most of us would expect to find .5% of acid in most any wool dyeing that has been dyed. It might be a simple matter to neutralize before the test. As for the Chromotrope F4B I am pretty sure a very moderate shade of that color will take all the chrome there is, something over 3%. It seems to take more than others.

APPLICANTS FOR MEMBERHIP

Student

Arthur L. Bertrand, Student, Lowell Textile Institute, Lowell, Mass. Sponsor: Louis A. Olney.

Junior

Barrett Fisher, Asst. Chemist, Sydney Blumenthal & Co., Inc., Shelton, Conn. Sponsors: Harold H. Taylor and Fred H. Webster.

Carl R. Gaede, Piece Dyer, Gaede Silk Dyeing Co., 4th Avenue and River St., Paterson, N. J. Sponsors: Robert H. Gaede and Frederick E. Otto.

Joseph Zaparanick, Chemist, L. Sonneborn Sons, Inc., Hancox Avenue, Belleville, N. J. Sponsors: William H. Cady and Richard B. Earle.

Active

Rudolph E. Semmler, Textile Technician and Chemist, Klein Bros., 205 West 39th St., New York City. Sponsors: Harry Levine and Morris Blackman.

Active

John D. Huizeng, Designer and Manufacturer of Silk Ribbon, Century Ribbon Co., 80 Madison Ave., New York City.

James Dixon, Sales Representative, 60 S. Delaware Ave., Philadelphia, Penna.

ANNUAL OUTING, PIEDMONT SECTION

Annual Outing, Piedmont Section

The Annual Outing of the Piedmont Section of the A. A. T. C. C. was held at May View Manor, Blowing Rock, North Carolina, on the afternoon and evening of June 25th, 1932.

About 120 were in attendance, and Field Day exercises were enjoyed by all.

About forty odd members participated in the golf tournament. The low gross score was made by R. R. Dorsett, runner-up was J. D. Sandridge. The low net score went to R. M. Mitchell, runner-up to J. M. Howard. R. E. Sumner won guest prize with low gross for visitors.

First prize in the bridge tournament was won by Mrs. Chas. S. Stone, second high score by Mrs. D. C. Newman.

Mr. M. M. Chapman, Manager of May View Manor, gave a loving cup to the golf players as evidence of his appreciation of their patronage, which convinced the organization that he was glad to do everything possible to see that they had a satisfactory meeting.

This being the annual outing, many of the members were accompanied by their wives.

Respectfully submitted,

J. D. SANDRIDGE, *Secretary.*

STANDARD SILK SAMPLES

There have been prepared, under the direction of the Sub-Committee on Fastness of Dyed Silk, standard dyed silk fabrics to represent four classes of fastness to washing—namely, Class I, Class II, Class III and Class IV. These standards have been carefully dyed with the dyestuffs and according to the dyeing methods recommended in the 1931 Year Book.

The A. A. T. C. C. is prepared to furnish sets of these washing standards for a nominal charge which will cover the cost of preparation. It will be possible to accurately grade the fastness to washing of any dyed silk fabric by comparing it with the standards after subjection to the standard washing tests approved by this Association. All inquiries concerning these Silk Washing Standards may be addressed to the Chairman of the Research Committee,

Louis A. Olney,
Lowell Textile Institute,
Lowell, Massachusetts.

ASSOCIATION BADGES

The lapel button badge illustrated herewith is worn by members of the American Association of Textile Chemists and Colorists.

The three "rings" are enameled in red, yellow and blue, respectively, and the initials and border are brought out in gold. The general effect is exceedingly attractive.

Badges may be secured at $1.50 each by addressing the Secretary.

A. NEWTON GRAVES,
Franklin Process Co.,
Providence, R. I.

AMERICAN DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto

LOUIS A. OLNEY
Professor of Chemistry and Dyeing, Lowell Textile Institute
Directing Editor

NORMAN A. JOHNSON
Managing Editor

MYRON DREW REESER
Advertising Manager

Published biweekly by
HOWES PUBLISHING CO., INC.
440 Fourth Avenue, New York City

A. P. HOWES, President — M. D. REESER, Secretary — H. F. CRAWFORD, Treasurer

Subscription price $5.00 per year; Canadian $6.80; foreign $6.00

Volume XXI July 18, 1932 No. 15

PHOTO ENGRAVING FOR PRINTING

ACCORDING to the *Journal of Commerce* there seems to be an international interest developing in the process of photo-engraving of copper rolls for textile printing purposes. It appears that the H. L. Boedecker process for this type of engraving has practical possibilities and is being pushed at the present time. Definite progress is now being made in this field. Several finishing plants have ordered rolls made by this process for experimental purposes.

The method used combines the processes of photo-engraving and lithography with the few essential changes necessary being made by Boedecker, whose accomplishments in a field not directly connected with fabric printing have been well known to certain groups of people for some time. The equipment consists of a very large Levy camera, two stop-and-repeat machines, photo-composing machine, automatic etching, very large plate coating drum, two flat bed presses, one for transferring design to roller and the other for making proofs of the design before the rollers are etched, thereby detecting any unevenness in design before proceeding any further. As is already in practice in this country, the screen used will give a line ruling similar to a pantagraph job. The ordinary photo-engraving roller has had either a half tone dot or a cross line gravure screen, giving any depth of etch up to 1/32 of an inch.

It is the opinion of some that greater progress on the fundamental work of transferring designs ready for the printer's use has been made by American technicians than those in Europe. However, at the present time there is considerable work in progress in Europe by technicians who are endeavoring to perfect a process of design transference thereby lessening the cost of design engraving and also enabling the printers to obtain refined reproductions of photographed designs. Many extravagant claims are being made concerning the accomplishments of these workers.

It will be well for our printers to watch the further developments in this field.

RAYON DEVELOPMENTS

AS YET there has been no standard adopted for the commercial weighting of rayon. A general meeting on this subject is scheduled for September by the Bureau of Standards. The chief difficulty attached to ironing out the situation is in the difference of opinion prescribed to by various groups within the trade. Certain converters of the woven fabrics are of the opinion that 4% is too great a tolerance for outerwear fabrics. On the other hand they are satisfied with the one per cent for underwear fabrics. They have adopted the stand that one per cent is ample for both classes of fabrics. Hayden B. Kline of the Industrial Rayon Corp. is also opposed to the 4% tolerance and is in favor of the one per cent allowance.

The opposite side of the question is upheld by the local group of knitters who maintain that the 10% allowable in the silk trade should also be adopted by the rayon trade. To those who are unfamiliar with this situation we refer to our editorial "Rayon Evils" which was published several months ago. We repeat that it is necessary that something be done to standardize the weighting practice in the rayon industry.

The recent drop in rayon prices has been interpreted by certain finishers as indicative of a coming demand for lower prices for finishing rayon fabrics. It is not necessarily true that a drop in the price of the fabric necessitates a drop in the finishing charges, but it is believed by some that they will be forced to reduce their prices in order that converters may sell the fabrics within a certain price range. Inasmuch as finishing prices are about as low now as they probably will be for some time there should be no real fear that they will drop. Should such a procedure be eminent there is only one thing for the finishers to do and that is to maintain a firm stand individually and keep the prices up. They are already low enough.

Sans Statistics

In the history of mankind, there have been many scourges, plagues and epidemics. The ravages of the Black Death, Influenza, and Yellow Fever, for example, have taken their toll of large percentages of the population in short periods of time. In general, people were divided into two classes by these epidemics: the weaker members of the population who died off, and those of sound physical constitution who lived and were stronger thereafter because of the experience.

American business today is afflicted with a serious and widespread plague. This disease is highly contagious, travelling rapidly from the manufacturer to the retailer and the consumer, as it does. We will call this disease LOWERITIS.

Its symptoms are feeble business policy, insistence on the price element in all dealing, and submergence of all quality considerations as a result. It was typified in a price war last winter between two New York department stores which, after many see-saw reductions to the silly end that one store should not undersell the other, finally sold $55 camel hair coats for $9.

The remedy for LOWERITIS is as simple as it is apparently difficult. It merely involves selling quality goods for what they are worth. And, strange as it may seem, the entire business community does not need to be rid of this disease at one fell swoop. The curative process is a matter of leaders in the manufacturing field, in wholesaling, in retailing, etc. taking the stand of "No more LOWERITIS." The cumulative and net effect of other business men following these leaders will finally purge business of this demoralizing disease.

Somebody must start the ball rolling, and these people will not be the goats, either. They will be the future leaders of the American business. Sell your quality goods at a fair price with every honest effort to make a profit; that single process, cumulatively and collectively, will stamp out the plague of LOWERITIS. Who'll break the ice?—*Textile Organon.*

Session on Textile Materials

Committee D-13 held a very interesting meeting this year in conjunction with the Annual Meeting of the Society at Atlantic City, June 21, 1932.

The recently organized Wool Committee presented plans which included revision of Tentative Methods of Testing Grease Wool and Allied Fibers for Scoured Content, and development of specifications for woolen yarns, cloths and felts.

A new section under Subcommittee A-1 on Cotton was formed. Owing to the dissimilarity of the problems in the manufacture of yarns and sewing threads, it was felt advisable to create a new section to be designated as Section VIII on Sewing Threads. Organization of this section will be effected at an early date.

Considerable discussion developed on the question of textile terms and definitions. Many of these have recently been revised and in order that the various subcommittees concerned may have the benefit of the opinions of the members at large, it was ordered that the Glossary of Terms and Definitions be submitted to the members for criticism.

The following officers were elected for 1932-1934:

Chairman .....H. J. Ball
First Vice-chairman .....B. H. Foster
Second Vice-chairman .....J. M. Weaver
Secretary .....W. H. Whitcomb

In the afternoon a Session on Textiles was held presided over by Dean Harvey, who, as Chairman of D-13's Committee on Papers, was largely responsible for securing the papers presented. After the reading and acceptance of the Annual Report, the following papers were presented:

"A Machine Test on the Durability of Manila Rope" by N. C. Wiley, Associate Materials Engineer, Bureau of Construction and Repair, Navy Department.

"Enzyme Action in the Textile Industries" by W. F. Edwards, Director of Laboratories, U. S. Testing Co., Inc.

"Atmospheric Control in the Textile Industry" by R. H. Brown, Research Engineer, Parks-Cramer Co.

"Asbestos Textiles" by C. K. Dillingham, Staff Manager, Sales Engineering Department, Johns-Manville Corp.

"Some Aspects of the Structure and Properties of the Rayons" by H. DeW. Smith, A. M. Tenney Associates.

"The Suter-Webb Cotton Fiber Duplex Sorter and the Resulting Method of Length-Variability Measurements" by R. W. Webb, Senior Color Technologist, Bureau of Agricultural Economics, U. S. Department of Agriculture.

"Colorimeter and Method Employed in the Color Testing of Cotton" by Dorothy Nickerson, Color Technologist, Bureau of Agricultural Economics, U. S. Department of Agriculture.

These papers covered a wide range of subjects and the interest in them was indicated by the good attendance throughout the session and the volume of discussion which followed. The papers and the discussion on them will appear in the *Proceedings* of the Society.

Correction

On page 432 in the July 4th issue in the article "The Application of the Stick Antimony Electrode to the Measurement of the pH of Dye Baths" in the first paragraph, second column, it should read "With dye solutions" instead of "With dry solutions." The last three lines in the same paragraph should read. "The pH of the solutions were calculated from the equation:

$$E = -0.007 + 0.05915\ pH."$$

Announcement

The Roller-Smith Company, 233 Broadway, New York, N. Y., announces the appointment of Mr. Alfred Suter, 200 Fifth Ave., New York City, as a sole distributor of Roller-Smith Textile Balances in the United States. Mr. Suter is one of the best known men in the country in the textile field and has specialized in equipment for that field for many years. The Roller-Smith Company has developed its Precision Balances for textile applications in a wide variety of forms and with attachments and accessories to provide for all known measurements.

Analytical Methods for a Textile Laboratory

(Continued from page 446)

No. 17 Potash Alcoholic (Approx. N/2)

Preparation

Grain alcohol is purified by boiling under a reflux condenser for several hours with some pure stick potash, and subsequent distillation. Then 28 gms. of pure stick potash are dissolved in one liter of this alcohol. The solution should be filtered from any insoluble carbonate before using.

Standardization

This is accomplished by running a blank in connection with each analysis in which this solution figures.

No. 18 Potassium Bichromate (N/10)

Preparation

The pure crystals of potassium bichromate are ground to a powder and dried in the oven at 110°C. for several hours. Then 4.9083 gms. of this powder are dissolved in several hundred cc. of water, and the solution diluted to exactly one liter.

No. 19 Potassium Fluoride Solution

500 gms. of pure KF are dissolved in 600 cc. of hot CO_2-free distilled water, adding 5 cc. of Phenolphthalein indicator and neutralizing if necessary with N/2 KOH or H_2SO_4 until about 1 cc. in 10 cc. of distilled water shows a faint pink color. Filter out any insoluble matter without washing and dilute the clear filtrate to one liter with CO_2-free water. Preserve in a wax bottle or a glass bottle coated inside with wax.

No. 20 Potassium Hydroxide (Approx. N/2)

Preparation

Dissolve 56 gms. of pure potassium hydroxide sticks in 2 liters of water, heat to boiling and add some freshly slaked lime, equivalent to 5 gms. of quick lime. Boil again and filter directly into a large bottle. Keep the solution from contact with the air as much as possible.

Titrate against the standard N/2 HCl and calculate normality.

No. 21 Potassium Permanganate (Approx. N/10)

Preparation

Weigh about 8 gms. of $KMnO_4$ into a beaker and dissolve in about a liter of hot water. Let the solution stand for at least ½ hour then decant off ¾ of the volume and dilute to approximately 2 liters.

Standardization

Weigh out from 0.15 to 0.20 gms. of pure iron wire and place in a 12 oz. flask. Then add 150 cc. of boiling dilute sulfuric acid. (This dilute acid is made from 1 volume of concentrated acid and 7 volumes of water). This solution is kept at a boil until all the iron is dissolved, the mouth of the flask being closed with an inverted porcelain crucible cover. When a clear solution is obtained, this is quickly cooled and titrated with the permanganate solution until a faint pink color is perceptible. Calculate the normality.

1 cc. N/1 $KMnO_4$ = 0.05584 gms. Fe.

Standardization (Optional Method)

Weigh out 1.9607 gms. of pure ferrous ammonium sulfate, $Fe(NH_4)_2(SO_4)_2.6H_2O$. Dissolve in 100 cc. of distilled water, add 5 cc. conc. H_2SO_4, cool and titrate at once with the $KMnO_4$ solution until a permanent pink color is formed. Calculate the normality.

1 cc N/1 $KMnO_4$ = 0.39214 gms. $Fe(NH_4)_2(SO_4)_2 6H_2O$.

No. 22 Potassium Permanganate (Approx. N/50)

Preparation

200 cc. of the standard N/10 potassium permanganate are diluted to exactly one liter.

No. 23 Potassium Sulfocyanate (N/10)

Preparation

Weigh accurately 9.717 gms. KSCN, dissolve in distilled water and dilute to one liter.

Standardization

Pipette 50 cc. of N/10 $AgNO_3$ solution into a white porcelain dish, add 100 cc. of water, 5 cc. of dilute nitric acid and 5 cc. of ferric nitrate solution (10% in strength and free from chlorides). Titrate with the N/10 KSCN until a permanent red coloration of the liquid appears.

Note: Potassium Sulfocyanate (N/1) is prepared and standardized as above, using 97.17 gms. KSCN per liter.

No. 24 Silver Nitrate (N/10)

Preparation

Weigh accurately 17 gms. of pure $AgNO_3$, dissolve in water and dilute to exactly one liter.

Standardization

Weigh accurately about 0.1 gms. of pure sodium chloride, dissolve in water, add a few drops of potassium chromate solution, and titrate with the silver nitrate until a permanent red tinge is obtained.

1 cc. N/10 $AgNO_3$ = 0.003546 gms. Cl

No. 25 Soap Solution N/250

Preparation

Prepare a stock solution first as follows: 30 gms. of pure Olive Oil Soap are dissolved in about 400 cc. of hot water. To the cool solution add 50 cc. of hexalin and make up to 500 cc. with water. This solution remains clear for a long time. To prepare a N/250 soap solution, take 25 cc. of the stock solution and make up to 200 cc. with distilled water.

Standardization

10 cc. of standard calcium chloride are placed in an 8 oz. glass stoppered bottle and diluted to 50 cc. with distilled water. The soap solution is added, 0.2 or 0.3 cc. at a time, shaking well after each addition, until a lather is obtained which is permanent for five minutes and covers the entire surface of the liquid with the bottle placed on its side. Calculate the volume of water to be added to make the soap solution equal in strength to the calcium chloride.

No. 26 Sodium Arsenite (N/10)

Preparation

4.95 gms. of pure arsenious oxide and 25 gms. of pure anhydrous sodium carbonate are dissolved in about 250 cc. of water by boiling. When cool, the solution is diluted to a liter in a volumetric flask.

No. 27 Sodium Carbonate (Normal)

Preparation

26.525 gms. of recently ignited pure Na_2CO_3 are dissolved in water and diluted to exactly 500 cc. volume in a volumetric flask.

No. 28 Sodium Hydroxide (Approx, N/10)

Preparation

Dissolve 16 gms. of pure sodium hydroxide sticks in about 2 liters of water, heat to boiling and add some freshly slaked lime, equivalent to 5 gms. of quick lime. Boil again and filter directly into a large bottle. Dilute to 4 liters with freshly distilled water and keep the solution away from contact with the air as much as possible.

Alternate Method of Preparation

About 32 gms. of pure NaOH sticks are roughly weighed out, the carbonate on the surface is washed off as much as possible by a stream of water from the wash bottle, and the alkali is then dissolved and diluted to 8 liters. This solution is standardized as below.

Standardization

The above solution of alkali is titrated against a given amount of standard N/10 HCl, using Methyl Red or Congo Red as an indicator, and then water is added in calculated amount until the two solutions are equal in strength.

Absolute Standard

Dissolve 0.2 gms. potassium acid phthalate in water and titrate with the N/10 sodium hydroxide, using Phenolphthalein as an indicator. Calculate normality.

1 cc. N/1 NaOH = 0.204 gms. potassium acid phthalate.

No. 29 Sodium Hydroxide (Approx. N/2)

Preparation

500 cc. of normal sodium hydroxide are diluted to exactly one liter.

Standardization

The solution is standardized against N/10 HCl.

No. 30 Sodium Hydroxide (Approx. Normal)

Preparation

40 gms. of pure caustic soda sticks are dissolved in water and diluted to one liter.

Standardization

This is determined by titration against N/2 HCl.

No. 31 Sodium Thiosulfate (Approx. N/10)

Preparation

Dissolve about 25 gms. of the crystalline salt ($Na_2S_2O_3.5H_2O$) in a liter of water.

Standardization

Measure out 25 cc. of N/10 potassium bichromate, dilute largely, add 10 cc. of conc. HCl and about a gram of potassium iodide, and titrate with the thiosulfate solution until the iodine color disappears, using starch to intensify the end point.

No. 32 Starch Solution

Preparation

Thoroughly mix about ½ gm. of starch with 100 cc. of cold water, then pour into 200 cc. of boiling water. Heat the whole to boiling with constant stirring and filter through a large filter paper.

No. 33 Zinc Sulfate (N/5)

Preparation

28.76 gms. of crystalline zinc sulfate ($ZnSO_4.7H_2O$) are dissolved in water and diluted to exactly one liter.

(Part III will appear in the next issue. It is entitled "Methods of Analysis").

Faults in Piece-Dyed Woolen and Worsted Materials*

Tracing the Cause by Textile or Chemical Tests

By DR. L. L. LLOYD, Ph.D. (Bern), F.I.C.

Piece-dyed faults may be caused by the dyer in the woolen and worsted trade by faulty preparing, inefficient dyeing, or during heat treatments in the finishing operations. Similarly, faults may be caused by textile operations such as spinning, twisting, setting of yarn, warping or weaving. In some cases faulty shades have been shown to be due to the nature of the raw material.

WORSTED materials when piece - dyed occasionally show a skittery appearance; this is understood to be an effect produced when some of the fibers appear to be only partially dyed, the color being mainly on the surface of the fibers.

Different Micelle Structure

With blues, navy blues, and blacks the overhand appearance is that of a grey effect. This defect has been proved to be caused by certain blends of wool, sometimes of too varied a thickness of fiber, but others of practically the same "quality" wool. Two cases of the latter on investigation have shown that the possible explanation of the cause of uneven dyeing is that of different micelle structure. The fibers that dye a paler and duller shade when viewed under the microscope in polarized light have been found to have a higher strain than those that dye evenly. The orientation of the micellular structure is consequently the cause of the varied color adsorption.

Cause of Listing

Listing is a common fault with piece-dyed goods and the main cause of the defect appears to be that of crabbing. This fault occurs with all types of worsted fabrics that have to be set before submitting to wet processing. In the crabbing process it has been proved that the use of alkaline water in the crab-bowl is very dangerous because the alkaline water acts as a hydrolytic agent on the wool with modification of the dyeing properties of it. The boiling water of the crab has readier access to the fabric from the selvedges towards the middle of the fabric and thus these portions have a higher degree of treatment by the alkaline solution than the body of the cloth. The tension under which the fabric is crabbed plays an important part in the degree of listing produced, too little tension giving listedness on dyeing much more than too high a tension. The acidification of the crabbing bowl liquor has not produced any improvement in diminishing listedness. The best results appear to be produced when a hard water, preferably permanent hardness, is used in the crabbing bowl.

Crabbing is often followed by wet-blowing, sometimes termed wet-decatizing, in order thoroughly to set the fabric to prevent too high a degree of shrinkage during scouring and dyeing or to prevent distortion of design. In this process wet steam is blown through the fabric in roll form and should always be double treatment on two separate cans in order to give as even a heat treatment from end to end of the fabric as possible. The tension applied to the fabric during winding on the blowing cans is very important; too little tension leads to listedness and too high a tension tends to make the fabric too lustrous and have a thinner handle. Wet-blowing is often applied for a very short period with the result that the heat treatment is not uniform from end to end and also from selvedge to selvedge; the result is that the wool will have different color adsorption properties and thus yield faulty dyed goods. If the fabric is made of wool that will not become too lustrous an extended time of wet-blowing is preferable to too short a treatment.

Dry Blowing

The author has found that goods that invariably give listedness may be obtained of a satisfactory nature when the setting is done by dry-blowing or decatizing. The drier the steam employed the more even is the result, and although it is a more expensive treatment it is economically better than other methods of setting. This method points to the view that highly twisted yarn that requires setting by steam would be more evenly set by dry steam than by wet steam, which is usually used for the setting of bobbins or pirns of yarn.

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*Paper read at The Textile Institute Annual Conference at Leamington Spa on May 20.

Barriness

Barriness in fabrics is also a serious source of color defect. The bars may run as sections through the length of the fabric or in bobbin width in the weft direction. Both of these defects have a sharp line of demarcation and as such cannot be produced by the dyer because no machine is employed that could follow a direct thread of either warp or weft. These defects are produced when the nature of the material differs or are caused by tension effects. In the warp direction the defect may be produced by heavier or lower tension during section beaming, whereby one or more sections are under different tensions to the others and by light reflection will then appear of a different shade. Weft bars may also be caused by tension, but the more common cause of this defect is that of uneven treatment of the cops or pirns; in some cases the defect is caused by setting by steam, in others through different moisture content (condition) of the cops. The damper the material the more readily will the yarn stretch during weaving, and will then give a different light reflection as well as a greater resistance to color absorption during the dyeing process. The two effects when combined produce a tremendous variation of shade, especially when viewed over-hand or on the table. Weft barriness is present in almost every piece-dyed worsted material, but the degree of difference is often so small as to be practically unnoticeable. Probably the only method of overcoming this defect is the use of box looms whereby the weft of several cops becomes so intermingled that the color appears even throughout the whole length of the fabric.

Careless Yarn Mixing

Piece-dyed faults are of common occurrence through the mixing of yarns of different runs, and are usually the result of carelessness in the weaving shed, although in some cases the spinner is responsible for such faults. The latter is also responsible for piece-dyed faults due to variation of the thickness of yarn, variation of counts and variation of twists.

Faults produced by the above-mentioned effects are very prominent with piece-dyed goods, but are scarcely discernible in woven dyed styles. The reason of this is that the variation of the physical properties of the yarn affects the penetration of the dye-bath liquor, and consequently modifies the amount of color absorption in the yarns of varied density and twist.

Listedness Produced in Dyeing

The dyer is occasionally responsible for listed pieces, but in these cases the listing is not as even from selvedge towards the center of the fabric as listedness produced through faulty crabbing or too hurriedly scouring the goods to produce the desired shrinkage. The dyer produces listed defects when the temperature of the dye-bath is raised too quickly and also when the acidity of the bath is too high at the beginning of the dyeing operation. By vessel dyeing in rope form the lists have freer movement than the body of the cloth, and consequently absorb dyestuff more readily, the absorbed dyestuff then combines with the wool, the latter depending on the properties of the dyestuff.

In many cases level dyeing is finally produced through the interaction of Glauber's salt which by a cycle of reaction acts as stripping and dyeing assistant. There are, however, many acid dyestuffs, particularly the fast acid colors, that do not respond to this reaction, and if once attached to the wool will remain fixed. These dyestuffs are rarely used on the majority of the Continental fabrics that are piece-dyed, and on account of this, rarely show listedness.

To find whether the listing is due to faulty dyeing or to faulty preparing, a strip of the material is stripped and is re-dyed with a level dyeing color; if the test piece gives a level dyed result, then the source of the defect is that of dyeing. Listed pieces that have the defect caused by faulty preparing would again give the defect on re-dyeing. In many cases, where the difference of shade is not too heavy, the stripped test piece should be heavily wet blown, preferably between wrappers, and then again dyed; this operation often corrects such faults and may be applied to the fabric.

Excessive Alkali

Goods that are taken from the scouring machine before the excess of alkali has been removed by washing may lead to listed pieces, particularly if after scouring they are kept in cuttled form for a sufficient time, two or three days, before dyeing. The moisture evaporates from the goods, mainly from the selvedges, when in pile, and thus allows alkali to concentrate towards the selvedges. Such material will, when dyed by most dyestuffs, show a degree of listing. The alkali has the effect of mildly hydrolyzing the wool and thus modifying the dyeing properties. In the woolen trade, where wet processing demands the treatment of the fabrics in a wet condition for some time, this type of fault is often produced. A good means of its prevention is the final washing off of the goods with hard water. The permanent hardness of the water reacts with the soda ash retained by the fabric with formation of calcium and magnesium carbonates, which do not cause hydrolysis of the wool and do not interfere with the dyeing operations.

Piece Carbonizing Faults

Piece carbonizing is also a source of dyeing defects, and since these faults are made apparent by the dyeing operation, they are often attributed to the dyer. After the goods have been thoroughly wetted with sulphuric acid solution of 6 to 8 deg. Tw., the addition of a wetting agent such as Nekal or Perminal aiding this operation, squeezed off, cuttled and allowed to stand for a short time for the acid liquor retained by the material to become evenly distributed over the fabric. The drying process is very important in that there is the possibility of migration

(Continued on next page)

HOLLOW RAYONS

(Continued from page 448)

spinning; such fibers lack a lumen as previously stated although they may be voluminous.

Schupp claims that hollow acetate rayon produced as indicated above with a specific gravity of about 0.8 has a tensile strength of 1.2 to 1.3 grams per denier and loses but 25 to 30% of this strength when wetted; it can be produced in 2 to 6 denier filaments.

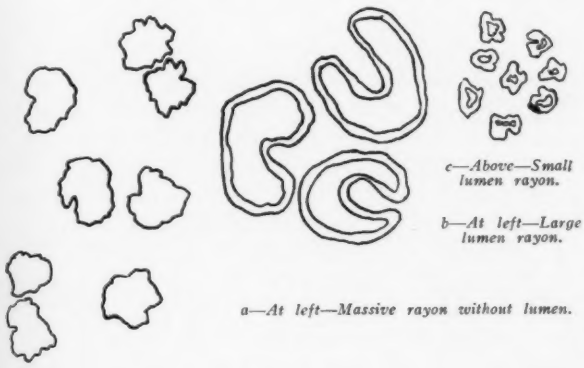


Fig. 2

As previously mentioned it appears likely that rayon having the warmth and softness of handle of real silk and wool will be produced by methods which involve the formation of air cavities in each fiber and research along these lines should lead to a definite expansion in the manufacture of rayon to take the place of the natural fibers.

FAULTS IN PIECE-DYED WOOLEN AND WORSTED MATERIALS

(Continued from preceding page)

of the acid towards the selvedges, because these positions will allow evaporation to take place more readily, thus giving a higher concentration of acid in these portions which by the heat of "baking" will modify the dyeing properties of the wool, in most cases increasing the combination of dyestuff with the wool, and thus producing listedness.

Moderately slow drying is essential at first again to aid the level distribution of the acid solution followed by moderately rapid drying at the temperature employed for the acid to hydrolyze vegetable matter. The effect of excessive acid treatment is recognizable by microscopic examination, the wool scales being attacked with cleave of wool cells. In some cases the carbonized goods are not thoroughly neutralized by washing with alkali, and if such pieces are dried before dyeing they often yield flecky and patchy dyeing. A sample of such faulty material when stripped and re-dyed again reproduces the same fault.

Acommon source of piece-dyed defect is that of priming of the boiler, which is caused by the solids that are in suspension in the boiler liquor being carried with the steam and delivered into the dyeing vessel. The suspended solids of the boiler contain calcium, magnesium, and iron compounds. Of these the latter are the most important because they act as mordants and usually cause a heavy saddening effect with most mordant dyestuffs. These suspended solids are in such a finely divided condition that they are mechanically absorbed by the wool, and with those dyestuffs that form lakes produce a permanent defect. These faults are usually of a blotchy nature and are recognized by determining the iron content of the ash of portions of the fabric that are faulty and portions that are unaffected. The relative amounts of the two must be considered, because practically all dyed wool will give an ash containing iron. In some cases the defect may be remedied by stripping or partial stripping with oxalic acid and bisulphite of soda, followed by the addition of sulphuric acid before washing off and then re-dyeing.

Mordanting is also a source of listedness and is mainly produced where temporarily hard water has to be employed for this operation. The effect of the temporary hardness is that of precipitating calcium chromate on the fabric, formed from the calcium carbonate that is mechanically attached to the wool reacting with the bichromate of soda. Such waters should be used along with tartar or argol for this operation, the amount being sufficient to give faint acidity to the bath.

From the above it is evident that there are many types of faulty piece-dyed goods, among which the faults due to textile operations are capable of solution of the source of fault by textile testing method, and others which are due to the dyer which may be solved by chemical or dyeing methods.

Carrying Out New Policy

Nopco technical men are carrying out the newly established policy of the National Oil Products Co., Harrison, N. J., of serving the users of sulphonated, emulsifiable, and soluble oils by industries rather than by territorial locations as is the general practice. In the textile industry, T. A. Printon and Dr. D. S. Chamberlin are visiting southern and mid-western mills and consulting them on their manufacturing problems. Dr. C. I. Post is aiding tanners, paper mills, and glue factories in the mid-western states with his technical advice. Other Nopco technical men are touring New England and the Middle Atlantic States, each devoting his energies exclusively to the particular industry or division of industry which he is most qualified to serve.

Quantitative Determination of Cotton, Wool, Silk and Artificial Silks in Mixed Textiles*

By P. KRAIS and H. MARKERT

The use of mixed yarns and fabrics other than those of wool and cotton or of silk and cotton or wool has increased very much lately and is still in progress. It has, therefore, become an important task to analyze these mixtures as exactly as possible. This is of interest, not only for questions of customs and tariff classification, but also for the manufacturer, buyer and user and, last but not least, for the dyer, when he has to work out his recipes.

We want to give you a short report of the methods we use and of their limits of exactness.

OF COURSE, it is necessary to remove all non-fibrous materials beforehand as completely as possible. Oils, fats, soaps, size, finishing materials, waterproofing materials, etc., must be extracted from the textiles by alternate treatments with ether, alcohol, enzymes, dilute acids and dilute ammonia, as the case may be, even by benzol and carbon disulphide, when Indiarubber is present.

A microscopical examination has to follow in order to ascertain which kinds of fibers are present. In the case of doubt this investigation must be completed by the usual coloring and dissolving reactions applied to the decolorized fibers. (Table 1.)

Supposing the impurities are removed and the kinds of fibers ascertained, then our next consideration will be the correct calculation of the moisture contents of each kind of fiber. The usual additional percentages allowed in conditioning houses are, of course, different from the real percentages, and also different from the real moisture content. (Table 2.)

TABLE 1—MICROSCOPIC APPEARANCE AND REACTIONS

	Microscope	*Iodine in Zinc Chloride*	*Diphenylamine in Sulphuric Acid*	*Acetone*	*Dye test*†
Wool	Scales	Yellow	—	—	—
Silk	Not streaky	Yellow	—	—	—
Cotton	Bandlike windings	Blue	—	—	—
Viscose Silk	Smooth or streaky	Blue	—	—	Pink
Cuprammonium Silk	Smooth	Blue	—	—	Dark reddish Blue
Nitrate Silk	Slightly streaky	Blue	Blue		—
Acetate Silk	Slightly streaky	Yellow	—	Soluble	—

† We recommend equal parts of a solution of 0.1 per cent Eosine (Colour Index 768) and of 0.1 per cent Benzoblue BX (Colour Index 472) in distilled water. Treat the sample for 5 mins. with this mixture at ord. temp., rinse well and dry.

This is a difficult question. The most rational way out of it seems to us to be, to weigh the sample after 24 hours' exposure in an atmosphere of 60 deg. or 65 deg. rel. humidity at ordinary temperature, and also to weigh the isolated fiber portions, having dried them at moderate heat, after the same exposure of 24 hours.

Now we come to the methods themselves. There are four kinds of dissolving methods which we use, according to the fibers we want to ascertain, following the principle, that it is always the best, to get the more important fiber or fibers directly (insoluble), the less important ones indirectly (dissolved).

TABLE 2—MOISTURE CONTENTS

	Standard Additional Per Cent H_2O	*Corresponding Per Cent H_2O*	*Usual Moisture Contents at 60 Per Cent Rel. Humidity Per Cent*
Worsted, worsted yarn noils, recovered wool	17	14.53	14
Wool, combed wool, tops, yarns therefrom	18.25	15.44	
Cotton	8.5	7.83	8.5
Silk (degummed)	11	9.91	8.5
Cellulose Artificial Silks	11	9.91	11.4
Acetate Silk	6	5.45	4.4
Mixed yarns of Wool and Cotton	10	9.09	—
Mixed yarns of Wool and Silk	16	13.79	—

1) *Acetone.* If acetate silk is present, this can be dissolved with Acetone at ordinary or slightly elevated temperature.

(2) *Caustic Soda boil.* About 5 g. of the sample (exactly weighed) are boiled with about 30 parts of 2 per cent caustic soda solution to one part of sample for ½ hour in a flask fitted with a reflux cooler, then the mass is put through a fine bronze sieve, washed out with flowing cold water, collected and dried. Wool and silk are dissolved, cotton (also flax and ramie) remain undissolved.

*Paper Read at the Textile Institute Annual Conference on May 19.

(3) *Sulphuric acid.* About 5 g. of the sample are put into a glass-stoppered flask and sulphuric acid of 80 per cent is added (proportions as before), the mass is shaken vigorously for a quarter of an hour, then again every quarter of an hour. After 3 to 4 hours the mass is put through a sieve and treated as under 2. All vegetable fibers are dissolved, wool and silk remain.

(4) *Calcium thiocyanate.* A solution of the technical thiocyanate is made so that 100 c.c. of it contain 100 g. of the salt. About 200 c.c. of this solution are put into a flask with wide neck, fitted with a vigorous stirring device, warmed in water bath to 70 deg. C., then about 1.5 g. of the sample are added and the whole is heated in the boiling water-bath for 1 hour under constant stirring (200 to 300 turns per minute). The mass is put through a sieve and washed as under 2, after the excess of liquid has been pressed off well with a glass rod. We use a copper-wire seive with 2,500 meshes per square centimetre, which is fixed in a kind of funnel made of brass sheet.

It is essential that the residues, after being dried, conditioned and weighed, are also examined under the microscope in order to ascertain that the fibers one expects are really present and in a pure condition.

Small percentages of the fibers which are supposed not to go into solution, are nevertheless dissolving by these methods, and so we give Table 3 showing the correction factors which must be taken into calculation.

TABLE 3—SOLUBILITY IN PER CENT

	Acetone	*Caustic Soda*	*Sulphuric Acid*	*Calcium Thiocyanate*
Wool unbleached	0	100	0	2.5
Wool bleached	0	100	0	3.5
Silk (raw, degummed, weighted)	0	100	0	100
Cellulose, Artificial Silk	0	> 6	100	100
Acetate Silk	100	> 6	100	100
Cotton, raw	0	ca. 3.5	100	4
Cotton, bleached	0	ca. 3.5	100	3
Cotton, raw mercerized	0	ca. 3.5	10	2
Cotton, mercerized, bleached	0	ca. 3.5	100	2

Supposing we have to analyze a fabric containing acetate silk, viscose silk, natural silk, cotton and wool, then we have the following manipulations:—

(*a*) Acetate silk to be dissolved out with acetone. Loss in weight: Acetate silk. The material thus treated is used for all subsequent operations.

(*b*) A part of (*a*) is treated with Sulphocyanate. Remains: Wool and cotton. Loss in weight: viscose silk and natural silk.

(*c*) Another part of (*a*) is treated with sulphuric acid. Remains: silk and wool. Loss in weight: viscose silk and cotton.

(*d*) A part of the residue (*b*) is treated with sulphuric acid. Remains: wool. Loss in weight: cotton.

(*e*) Another part of the residue (*b*) is treated with caustic soda. Remains: cotton.

(*f*) A part of the residue (*c*) is treated with thiocyanate. Loss in weight: silk.

(*g*) From the sum of cotton and viscose silk found under (*c*), the cotton found under (*e*) is subtracted, which gives the amount of viscose silk.

New General Releases

The General Dyestuff Corporation has issued new cards on the following:

Indanthrene Printing Brown D Extra Paste—a new homogeneous dyestuff, which is especially recommended by the manufacturer for printing purposes. Fastness to light, soaping, chlorine are claimed for this dyestuff.

New Naphthol AS-LB—said to be suitable for production of Fast Brown shades, being further augmented by its suitability for discharge work as well as for direct printing.

Indanthrene Brilliant Blue RCL Powder—a new dyestuff of the Indanthrene range which is said to yield bright reddish blues which are very close in shade to the Indanthrene Blue R, but possessing the important advantage of much better fastness to chlorine. It is claimed to be suitable for dyeing cotton, linen, other vegetable fibers and real silk.

Fast Black Salt G—a new fast color salt for printing on Naphthol AS prepare. It is said to be superior to the existing Fast Black Salt K and Fast Black Salt B because of its very good solubility. It is further claimed that the new product does not require acetic acid and no orange salt need be added to produce a jet black.

Palatine Fast Violet 5 *RN*—said to produce from a strong sulphuric acid bath a reddish violet of very good fastness to light washing, decatizing, carbonizing, perspiration and salt water. It is also said to be suitable for printing, leaving a white discharge with Rongalite C.

Fastusol Brilliant Blue RL—a homogeneous product said to be of very good fastness to light and of exceptionally bright shade. The manufacturers claim that it is superior to any existing fast to light blues. It is further said to be well suited for dyeing cotton-rayon the same shade and leaving acetate silk effects clear.

Indanthrene Printing Blue B Suprafix—lies in shade between the recently brought out Indanthrene Printing Blue 2G Suprafix and the slightly older Indanthrene Printing Blue R Paste, all three of which are said to represent blues of very good fastness properties including the fastness to chlorine.

Katigen Blue Green GA—a sulphur color said to be of a particularly bright shade which shows up well, under artificial light. It is further claimed that the product has excellent solubility and good fastness to light, washing and alkali.

Indanthrene Printing Brown B Suprafix—representing a further addition to the suprafix range. It is claimed that the new dyestuff fixes readily, even under varying steaming and moisture conditions. It is further claimed that the dyestuff paste has no tendency to settle or dry out and is non-freezing.

Technical Notes from Foreign Sources

Modification of Spinning Bath; Viscose

German Patent No. 450,195 (29/IX/'27)—*Courtaulds Ltd.*—A modification of the sulphuric acid- glucose spinning-bath. Instead of employing pure glucose, starch or starch-yielding substances are employed in the bath. Various methods may be used for making up the bath—dissolving the starch in strong sulphuric acid, adding it as paste, etc. Such baths are ready for use as soon as prepared, and give the viscose-fiber the flexibility associated with the use of glucose in the spinning-bath.

Vat Dyestuffs Intermediates

German Patent No. 453,768 (17/XII/'27)—*I. G. Farben-Ind. A.-G.*—The products specified are derived from anthrone or its substitution-products by condensing with dialdehydes-glyoxal, its homologues, bisulphite derivatives, sulphuric acid esters, etc.—or other dialdehydes, or compounds which will give rise to such compounds. A suitable solvent is most favorable, and in some cases a condensing agent.

Simple aldehydes so treated yield products of no dyestuff character, but the present products are already dyestuffs, and can also be used for the synthesis of still other more complicated dyestuffs.—Two examples.

Dyeing of Pelts, Feathers, Hair, etc.

German Patent No. 461,752 (7/VI/'28)—*I. G. Farben-Ind. A.-G.*—Most methods for dyeing the above materials have up to the present consisted in the use of basic or acid dyestuffs or else in the employment of compounds such as diamines, aminophenols, etc., which are "developed" by treatment with an oxidizing agent, such as in a nitrite bath. The present method consists in impregnating the material with mixtures which contain certain appropriate diazotizable amines, suitable second components, and nitrite, with perhaps the addition of soaps, Turkey-red oil, etc., the color being developed by treatment in an acid bath. Alternatively, the nitrite may not be a component of the first bath, but of a second, or second and intermediate, bath. The dyeings carried out according to the six examples given are stated to be fast to light and rubbing, nor does the dyestuff sublime from the material, as is sometimes the case with pelts dyed in the older manner. 5-Nitro-2-4-toluylene-diamine is a favored amino-compound, and beta-naphthol such a second component. Tones from brownish-yellow through reds and grays to black are obtainable.

Algae and Their Uses

Dr. A. Beyer — Tiba v0,209 (1932) — A somewhat lengthy paper upon the algae or seaweeds, with general reference to their use or usefulness in textile work. The paper is headed "A conference held at the first Congress of the International Federation of Textile and Dye-Chemists," and opens with the dramatic query "What is the relation between the textile industry and the ocean?"

The whole paper treats the topic well, and the sections are carefully worked out. The first sections form a general view of the classification of the seaweeds, which requires a little general knowledge of a botanical sort to make it quite clear and interesting (which it decidedly is). The succeeding sections deal with the chemical composition of various industrially valuable species, with notes upon their uses; the final sections (of this part, for the paper is to be continued) deal with the question of the mode of synthesis, in the living plant, of the mucilagineous substances upon whose abundant presence the usefulness of the plants depends, and with a classification of the different groups of mucilage obtainable by different modes of physical and chemical treatment.

Curcuma

L. B.—Tiba 10,223 (1932)—Curcuma is the substance better known in this country as turmeric, and which we generally think of as the coloring matter used to impart a yellow color to various preparations of pickles and condiments: to a less degree, in the laboratory, as affording a test paper considered by some to be a useful indicator for the presence of boric acid. The paper is a short, general, interesting essay upon its different uses.

"As curcuma is very rich in a yellowish-orange coloring matter, it is widely used for tinting paper, wood, lacquers, wax, leather, pastry, cheese, oils, pomades, certain varnishes, and as a bottom color for gilding.—It is unfortunate that the coloring matter possesses so little solidity, and cannot acquire this fastness, in which it is so deficient, by means of mordants, for there is no other vegetable coloring-matter which furnishes a golden or orange yellow as brilliant; unfortunately, mere contact with an alkali, soap, or even saliva is sufficient to alter the color to a red, though acids at once restore the original color. It is the only natural yellow coloring matter which dyes cotton directly without a mordant. Light rapidly destroys the dyeings."

It is surprising to find that the substance really is used to some extent as a dyestuff in shading reds, e.g., with safranines, upon cotton. And, lately, some dyers have used it in shading some of the newer mode-dyeings, beiges, tangos, browns, greens, etc.

Naphthol AS Dyeings Upon Artificial Silk

G. Rudolph—Kunst-Seide 13,263 (1931)—An excellent practical paper, with many recipes and procedures. The general methods spoken of do not, of course, vary

very much from those in use with cotton. One point raised is interesting; that, with this method of dyeing, a viscose which, in other ways, is difficult to dye level, here comes out with good uniformity of dyeing quality.

Turkey-Red and Naphthol Red in Acid Bleach Liquors

Deutscher Faerber-Ztg. 67,716 (1931)—In a piece of goods which had come under investigation, different colors, among them red-effects, were components of both the warp and woof. After bleaching, a part of the red yarns was here and there completely bleached out, while other red-elements had retained their color in the original depth. The bleaching firm stated that the goods were unaltered after kiering; that the trouble had come to light after the bleaching was finished. It was found that two different sorts of red-dyed yarn had been used in weaving the goods; Turkey-red and Naphthol red. Turkey-red is well known to be very stable toward alkaline bleach-liquors, but in acid bleaches it is more or less wholly destroyed; this was the explanation of the trouble noted. During the bleaching, the goods were not carefully kept submerged in the bath, with the result that the carbon dioxide of the air was sufficient, in the areas where the goods were allowed to float on the surface of the only mildly alkaline bleach-liquor, to neutralize the latter. The note (No. 276) adds, that in the bleaching of Turkey-red dyeings—more properly, of goods dyed partly with that color,—there should be a reasonable excess of free alkali present, and in no case should an acid bleach be employed. Since in recent years, through the new combination of Naphthol AS-ITR/Fast Red Base, such an excellent fastness is possible, that only the very best Turkey-red dyeings can at all approach it, this combination is being used more and more. Since, in addition, the dyeing with Naphthol Red dyestuffs is technically much simpler and rapid than is Turkey-red dyeing, especially if it is a question of gaining pronounced fastness, the Naphthol Red dyeings are gradually displacing the Turkey-red process—not only on the score of ease of application and fastness, but in addition because penetration is better.

General Remarks on Lyonnaise Printing

P. le Tellier—Tiba 10,227 (1932)—The concluding section of the paper. This section is devoted to explanations of the purpose and action of such assistants as glycerol, acetine, sulphonated oils, turpentine, etc., in the printing paste, and gives several recipes for different pastes.

Ultra-Violet Light in the Textile Industry

G. Desmurs—Tiba 10,231 (1932)—A brief, general essay on the topic. The second part deals with the use of the ultra lamp in sericulture.

Progress in the Naphthol AS Field

Dr. Hans Kramer—Tiba 9,739 (1931)—A lecture delivered at the first Congress of the International Federation of Associations of Textile Chemists and Colorists. An interesting paper, but of descriptive and historical nature. One or two points of interest may be quoted:—"In working with the hot-flue, account has to be taken of the fact that the Naphtholate on the fiber is extremely labile (liable to alteration), and decomposes, under the influence of the water present, into the free Naphthol and caustic soda, even when an excess of free alkali is present. The free Naphthol couples very slowly. Such a decomposition, however, gives clearer tones (though weaker). To guard against this decomposition, the drying must take place very rapidly, at a high temperature. This condition does no harm to the members of the Naphthol AS series, since, in contrast to beta-naphthol, the Naphtholates are stable up to 100° C., at least.

"In drying on cylinders, this decomposition is not to be feared, since the drying is sufficiently rapid. However, if the same surface of a run of cloth always passes over the heated cylinders, the Naphtholate 'wanders,' and becomes more concentrated upon the drier side of the cloth. In this way, one gets pieces in which the surface which passed over the cylinders may show a difference in depth of tone of as much as 80% over the other surface. The Naphthols possessing a high affinity for cotton 'wander' less than do those of lower affinity, since the Naphthol is better fixed upon the fiber. To avoid this difficulty, Naphthols of higher affinity for the fiber are chosen when possible for the tone desired, and a dryer is used of such type that the piece of goods presents its surface in alternation to the heat, in passing from cylinder to cylinder."

Dry-Cleansing Solvents; Decomposition by Moisture

Deutscher Faerber-Ztg. 67,762 (1931)—Carbon tetrachloride possesses an absolutely neutral reaction, and has no effect upon either cotton or wool; even in the presence of moisture it has no effect upon either of these two fibers. Copper or iron, however, under some conditions, will react with tetrachloride. In using this solvent for dry-cleansing, therefore, special containers, either tinned, leaded, or enamelled, should be used (query No. 165).

Another note (answer to the same query) states—the behaviour of carbon tetrachloride differs, according to whether it is kept in glass (enamel) or metal containers. The oxygen of the air, in the presence of moisture, brings about no chemical change in the tetrachloride, even when exposed to direct sunlight, provided that the liquid is stored in non-metallic vessels. But, if metal containers are used, chemical change does take place: it is well known that moisture, in the presence of certain metals, does bring about chemical reaction, resulting, of course, in a change of some of the properties of the tetrachloride. The precise reaction taking place, however, is strikingly different, according to what metal is involved.

Defects of Periodical Character

J. Pinte—Tinctoria 31, 101 (1932).—A systematic survey of the causes and methods of recognizing determinatively the defects in finished goods. A good article, showing the author to be expert in such matters.

Textile Color Card Association Scholarships

The fourth annual scholarship awards made to students in the Lowell Textile Institute, the New York Textile High School and the Philadelphia Textile School have just been announced by the Textile Color Card Association. The terms and purposes of the scholarships were arranged in cooperation with the principal of each school.

At the commencement exercises of the New York Textile High School held recently, Miss Matilda Krampitz, a member of this year's graduating class, was awarded the color organization's scholarship at that school, because of her high rating in color appreciation and application. She will receive the amount of the award in ten monthly payments during one year of post-graduate study and research in color at the above school.

The winner of the scholarship at the Philadelphia Textile School for the coming academic year is Sydney Lewine, whose tuition will be paid for the senior year. The recipient of the award at the Lowell Textile Institute for the coming year will be announced shortly. The terms of the scholarship at this institution are the same as those prevailing at the Philadelphia Textile School.

At the end of the year for which the scholarship is granted, each student is required to present a thesis on color to the Textile Color Card Association. Following are the subjects of the theses submitted by holders of the Association's scholarships during the past year:

"The Effect of Composition on Color," John Valenza (New York Textile High School).

"Modification of Color Due to Textile Processes," Henry Golec (Lowell Textile Institute).

"Color—A Reflector," Normal Fridlington (Philadelphia Textile School).

1932 Fall Hosiery Colors

Eight new colors are shown in the 1932 Fall Hosiery Card just issued by the Textile Color Card Association to its members. These shades have been closely correlated with the outstanding colors in textiles, garments and shoes, thus assuring the correct harmony or contrast with the basic color note of the costume.

Following this season's procedure of issuing a color chart particularly adapted to the needs of each membership group, the Association, as a special service to its hosiery and retail members, has just sent out the 1932 Fall Coordination Chart. Highlights of each basic color range are portrayed in silk and woolen swatches, together with their correlated hosiery, shoe and bag shades in stocking material and leather. This chart of costume and accessory colors is expected to prove especially helpful for the successful merchandising and style promotion of the fall hosiery shades.

Chlorantine Fast Green BL

This material is said to be suitable for production of excellent fast to light and good fastness to washing shades on cotton, viscose and silk yarn for decorative materials as well as mixed fabrics.

Chlorantine Fast Green BL is also especially recommended by the manufacturer for the production of two color effects on cotton-wool, wool-viscose and cotton and silk unions, the animal fibers being almost completely reserved by temperature up to 140°F. An addition of Albatex WS allows the temperature to be raised to 160°-180°F, whereby a better exhaust is obtained.

Cibacete Brilliant Pink 4B Powder

This material is suitable for dyeing in a soap bath and said to yield dyeings having a very good fastness to light, good fastness to water, washing, hot pressing, rubbing and scrooping. The new dyestuff is also said to level very well and tint cotton and viscose very little and wool and silk only slightly.

Cibacete Brilliant Pink 4B Powder is claimed to be adaptable for use in Direct Printing on Acetate Silk but is not dischargeable. These products are marketed by the Ciba Co.

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

DYER

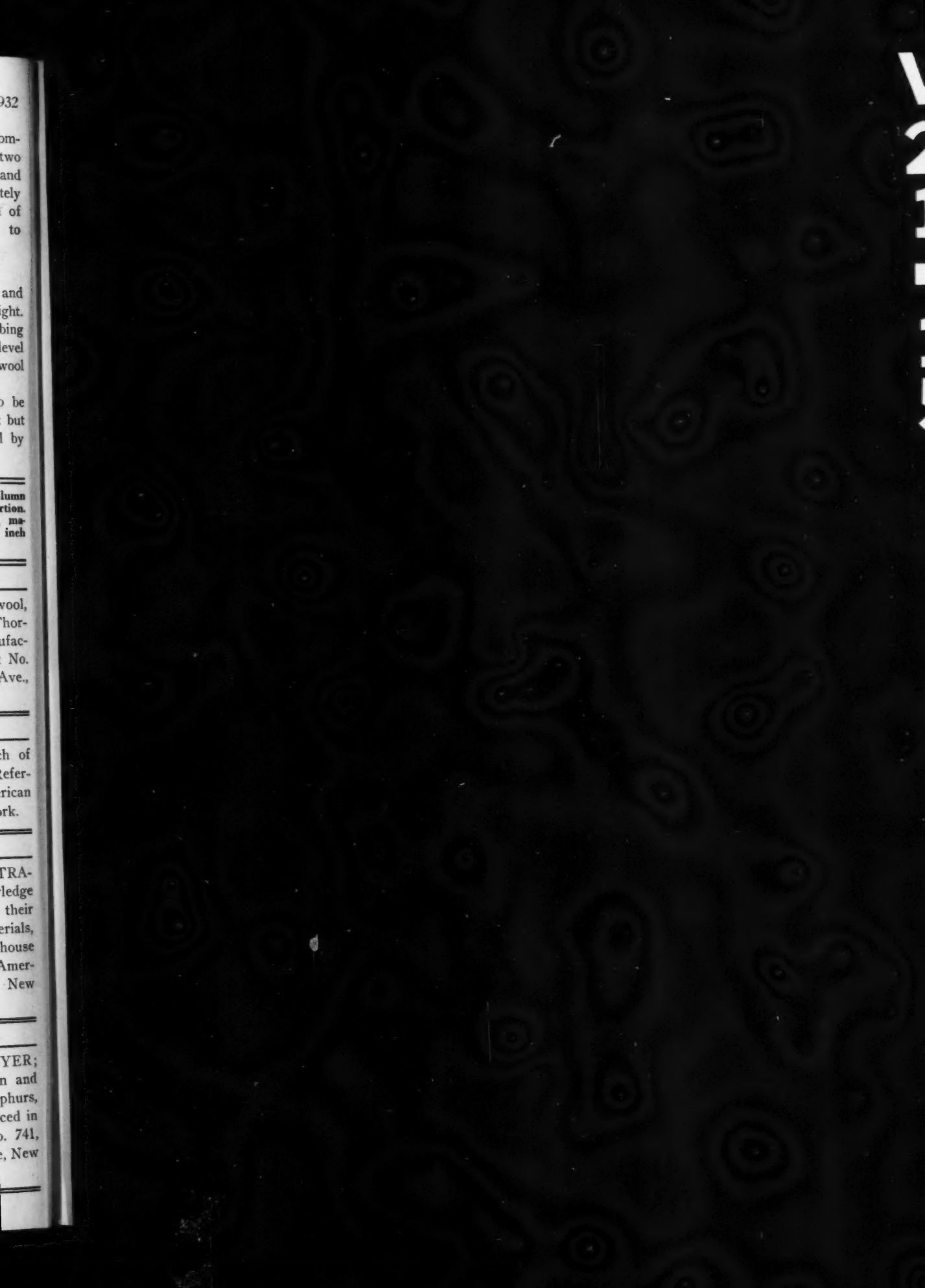
Six years' experience at bleaching and dyeing wool, cotton, jute and union raw stocks and yarns. Thoroughly experienced in all stages of carpet manufacture. Age, 26; married. Address: Classified Box No. 731, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

CHEMIST

Experienced in the manufacture and research of sulphonated oil, leather and textile specialties. References furnished. Address Box No. 737, American Dyestuff Reporter, 440 Fourth Avenue, New York.

POSITION WANTED

EXPERIENCED SALESMAN-DEMONSTRATOR, Chicago Territory. Has thorough knowledge of all dyestuffs, imported as well as domestic, their application, and the use of all finishing materials, water softeners, penetrators, etc. Practical Dyehouse experience. References. Address Box No. 740, American Dyestuff Reporter, 440 Fourth Avenue, New York.

WANTED

POSITION AS SUPERINTENDENT OR DYER; more than twenty years' experience on cotton and rayon piece goods and mixed fabrics, vats, sulphurs, and developed colors; also thoroughly experienced in mercerizing and bleaching. Address Box No. 741, American Dyestuff Reporter, 440 Fourth Avenue, New York.